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ABSTRACT

Three reading procedures for learning isolated words--whole-word, syllable-blending, and phonics-blending--were examined to determine which was the most effective for preschool children. The six preschool children in the study were divided into two groups to assess the effects of the length and number of different letters in a series of training words on acquisition, maintenance, and generalization. The words were counterbalanced across procedures, subjects, and presentation positions. The results showed that the whole-word procedure resulted in the most rapid acquisition for recall, the fewest training errors, the fewest letter-order recognition errors, and the most frequent recall of training words in compound words, sentences, and stories. After the syllable- or phonics-blending procedures, the subjects performed better for both reproduction of individual letter-sounds and generalizations of letter-sounds to pseudowords. Regardless of the training procedure, all words were maintained equally. (FL)

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FUNCTIONAL ANALYSES OF ACQUISITION, MAINTENANCE AND GENERALIZATION BY READING

(A Brief Report*)

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CS004537

Functional Analyses of Acquisition, Maintenance and Generalization by Reading

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The question addressed in the present basic research was, "What is the most efficient reading procedure for learning isolated words -- whole-word, syllable-blending or phonics-blending -- for the very young child for acquisition, maintenance and various types of generalization?"

Background

Reading methods research between 1912 and 1965 summarized by Chall (1967) in Learning to Read: The Great Debate showed, given time, the phonics method was superior to the whole-word method in teaching beginning reading to kindergarten and grade school children up to the fourth grade. (In the whole-word method the child pronounces the complete word only, while in the phonics method the child pronounces the individual letter sounds in the word and then blends those sounds into the complete word.) The first-grade reading methods research sponsored by the U.S. Office of Education in 1964 and 1965 compared many approaches besides whole-word and phonics methods such as ITA, diacritical markings, the language arts approach, etc. Stauffer's (1967) summary of these studies indicates that no one approach was distinctly better than another in all situations. More recently, several researchers (Rozin, Portisky and Sotsky, 1971; Rozin and Gleitman, 1971) have suggested that the syllable method, which had not been examined in Chall's or Stauffer's groups of studies, was more efficient than phonics, at least in the initial stages of reading. (In the syllable method the child pronounces each syllable in the word and then combines them into the whole word.) The three reading methods of whole-word, syllable-blending and phonics-blending have not been directly compared. It seemed that one of these methods might be more

effective than one or both of the others, especially if all other variables that could interact with learning to read were held constant.

In their summaries of reading methods research both Chall and Stauffer mentioned various "weaknesses" in experimental designs that often precluded definitive conclusions. The majority of the research were classroom studies in which many variables could not be tightly controlled. There were not equal amounts of teacher attention and child training in methods compared. Different teacher's personal techniques were seldom, if ever, controlled across methods, and, of course, it is well known that a good teacher can often make the most of a poor method. Methods were confounded; for example, some whole words and phonics words were taught within a single method. Standardized reading tests were often used for the final evaluation of a method; a method could be teaching an important response in the complex act of reading that was not assessed by the standardized test. The experimental designs were group designs which did not detect individual differences and which possibly masked trends due to large individual differences. Chall and Stauffer, competent evaluators, acknowledged these weaknesses in the research on which they based their conclusions.

Therefore, the present laboratory study was designed to compare three experimental training procedures, each characterizing the whole-word, syllable-blending or phonics-blending procedures while controlling as many variables noted above as possible. Each training procedure was planned, as much as possible, not to confound one with another and to allow for a consistent evaluation of responses across procedures. The training procedures were the same except for the characteristics unique when training words by whole-word, syllable-blending or phonics-blending. That is, all training used: 1) the same teaching team (one teacher and one observer that alternated roles)

for all children; 2) the same modeling, imitation and reinforcement procedure; 3) the same number of responses to the training cards; 4) the same types of nonstandardized criterion-referenced tests; and 5) the same three procedures for all children (an individual analysis design), thereby reducing individual differences compared to when different training is associated with different groups of children. Thus, the whole-word, syllable-blending and phonics-blending training procedures and the comparison of procedures within each subject reduced the number of uncontrolled variables, and variation in acquisition, maintenance and generalization could be attributed to a procedure with some confidence and not to another variable.

It was recognized that these experimental reading procedures did not exactly parallel reading procedures used in classrooms. For example, the phonics procedure is often introduced after a child has learned a certain number of words by sight, and then a specific sequence of phonics sounds are taught. These experimental reading procedures were designed to eliminate confounding variables not to simulate typical classroom reading procedures.

There was particular interest in whether one of these training procedures was more efficient for the preschooler since the practice of teaching reading to very young children appears more evident (e.g., Blanton, 1971; Durkin, 1976; Emery, 1975; Pines, 1967; Popp, 1975; Smethurst, 1975). Another reason for having very young children participate in this study was to possibly guarantee "naive" nonreading subjects who would not on their own use a variety of reading procedures or predominantly one procedure to the exclusion of another. Therefore, the children selected for this study were preschoolers, not kindergarten children, considering both chronological and mental age.

The results of this study will be presented and then interpreted for implications for the teaching of reading to very young children.

METHOD

Subjects and Setting

Seven children from the Edna A. Hill Child Development Laboratory at the University of Kansas participated in this two-semester study during 15-minute individual testing and/or training ssssions scheduled for each school day in a small experimental room. Six children participated both semesters of the school year; the seventh child was a replacement for one of the original six children who met criterion on some of the new second-semester words and therefore was no longer an appropriate subject. This group of seven "typical" preschool children had a mean mental age of 4-1 (range 3-1 to 5-2) on the Peabody Picture Vocabulary Test and a mean chronological age of 3-10 (range 3-3 to 4-8). The children selected as subjects did not verbally recall the training words upon their individual presentations and did not point at more than chance level to the correct choices (during recognition tests) of the training words amid distractor words. The parent(s) of each subject signed a consent form for the child's participation in the research.

Design and Procedures

An individual analysis design was utilized to control for individual differences of the six subjects. That is, experimental control was within subjects (individual analysis design) rather than between subjects (group design) since each subject was trained by all three reading procedures -- whole-word, syllable-blending and phonics-blending. However, a particular training word was always associated with the same procedure for an individual child. Thus, it could be determined which reading procedure, if any, was the most efficient for acquisition, maintenance and generalization of training words for an individual child. In addition, the individual data could be

grouped to indicate which procedure, if any, was the most efficient for the group. This individual analysis design was used for the original training during a fall semester and a replication during the spring semester.

The six subjects were divided into two groups to assess the effects of the length of training words on acquisition, maintenance and generalization (Table 1). Group I (three subjects) originally learned three-letter words, then during a replication learned four-letter words. Group II (three subjects) originally learned four-letter words, and had five-letter words taught during the replication. The pool of 18 words was counterbalanced across subjects and training procedures to control word difficulty (Table 2).

Two other controls for counterbalancing word difficulty were also utilized -- the number of different letters in each group of six words and the presentation order of the words. The group of three-letter words had 13 different letters and each group of four-letter words and five-letter words had 15 different letters. Though the number of different letters in each group was not the same, it was felt that the difference was minimal and reasonable within the practical limitation of using different length words. The training words were presented to each child in a predetermined order so a particular training procedure or word was not always at the beginning, middle or end of a session. If a particular child learned more easily at the beginning, middle or end of a session, the presentation order would offset that effect.

A single subject's experimental history was systematically designed to determined or train the prerequisite skill of word meanings, then to determine letter-name knowledge of letters in the training words for correlational purposes, and finally to preprobe for recall and recognition of words to be trained and to preprobe for some of the generalization measures based on those

words to guarantee that those responses were not in the subject's repertoire before training. After the words were learned, each subject was tested on progressively more complex generalization tasks (i.e., isolated letter sounds, isolated syllables, pseudo words, compound words, sentences and stories).

To summarize, the present study used an individual analysis design for original training and a replication to study acquisition, maintenance and generalization effects of three reading procedures on preschoolers of similar mental and chronological age. The training words were controlled for length and number of different letters and were counterbalanced across procedures, subjects and presentation positions.

RESULTS

Interjudge reliability was taken for each child's responses during all probes and training sessions, except for the few occasions during the absence of that session's reliability observer. Reliability for all children's responses was in the high 90's. Reliability for the experimenter praise contingent on child correct responses was 100%.

For the group the whole-word procedure resulted in the most rapid acquisition for recall, fewest training errors, fewest letter-order recognition errors and most frequent recall of trained words in compound words and in sentences and stories read to the child by the experimenter (Figures 1, 2, 3, 4, 5 and Table 4). After syllable-blending and/or phonics blending there was better performance for reproduction of individual letter sounds and generalization of letter sounds to pseudo words (Figures 6 and 7). The highest syllable generalization was for phonics in the fall semester and whole-word in the spring semester (Figure 8). Though each of the three reading

procedures showed unique advantages, all words were learned by all procedures, and all words, regardless of how they were trained, were maintained equally well. However, it should be noted that the individual data (not shown) did not always match the group trends.

DISCUSSION AND IMPLICATIONS

Despite extensive research on reading training procedures, there has been no analysis of the comparative effects of whole-word, syllable and phonics procedures. Proposals for teaching reading to preschool children and for individualizing reading instruction suggest the need for an individual analysis of data based on the more discussed procedures of whole word, syllable and phonics for the very young child. This study undertook this analysis with young prereading subjects in an experimental laboratory setting.

If one is concerned only with finding the most efficient reading procedure for a group of preschoolers from the standpoint of time, the present data suggest an answer. This group of 3- and 4-year-olds generally learned to recall words in fewer sessions, with fewer training errors, by the whole-word procedure as compared to the syllable and phonics procedures during both fall and spring semester. Surprisingly, even words spoken with a natural two-syllable division were learned more quickly by the sight procedure. One would have expected that there might be a carryover effect from hearing a two-syllable word, to learning to read a two-syllable word by the syllable procedure (Liberman, Cooper, Shankweiler & Studdert-Kennedy, 1967; Pick, 1972).

Though the difference in learning time between whole-word and the other two procedures was not always statistically significant, it was consistent -- with little variability across individuals -- and did result in the children learning whole-word words approximately two days (sessions) before the syllable and phonics words were learned. This two-day difference could be

important from the point of view of both the child and the teacher. The child might be motivated to continue to learn to read by this early success. The teacher would have more time to teach reading subskills which seem to be necessary for some individuals, as indicated by the individual data which was not presented. For example, though the phonics procedure produced the most generalization of letter sounds, there were some children who had no letter-sound generalization from phonics-taught words during a semester. For these children extensive, additional training of letter sounds with flash cards, phonics boxes (i.e., objects in a box that have the same beginning sounds) or workbook drill should be helpful.

This study demonstrates other advantages of the whole-word procedure for preschoolers. Overall, more whole-word words were recalled in compound words, sentences and stories than syllable and phonics words. The recall of a learned word in a compound word is a helpful skill that is sometimes trained as a reading technique. This skill seems to be a natural corollary of learning a word by the whole-word procedure. The recall of a word in the context of a sentence or story is perhaps more related to the purpose of reading (the chaining of meanings of words for comprehension) than recall of a word in isolation. Though the sentence and story tasks in this study were simple, they provided a beginning for chaining of word meanings for comprehension.

Also, there were fewer letter-order errors and more approximate syllable generalization after the training of the whole-word words than words taught by the other procedures. Fewer letter-order errors are necessary for not confusing similar words. The marked approximate syllable generalization for whole-word words might suggest that children were more willing to guess syllables utilizing parts of their whole-word words because they knew the whole-word word better than syllable and phonics words. It is desirable to

engage in some guessing behavior in reading because the rules of pronunciation are not always applicable.

Thus, it can be seen that the whole-word procedure was perhaps more effective with regard to speed of learning words, recall of words in rather complex contexts (compound words, sentences and stories), letter-order errors, and guessing of letter sounds (approximate syllable generalization).

Over the two semesters, the phonics procedure also had strong points to recommend it for preschool children, such as more individual letter-sound generalization and more exact syllable generalization after training, than either the whole-word or syllable procedures. Such letter-sound generalization and exact syllable generalization, of course, help children decode new words independently and eliminate the need to memorize each word individually.

One consistent positive advantage of the syllable procedure over the other two procedures was more pseudo-word generalization. The children seemed to recognize the syllable configuration in the pseudo-word and responded appropriately to it but they did not respond to individual letter sounds. Since whole words did not appear in the pseudo-words, children could not respond to them. Although some reading specialists suggest that the syllable procedure in comparison to phonics may facilitate faster acquisition of words (e.g., Gusak, 1972, p. 43; Harris, 1970, p. 337; Rozin & Gleitman, 1972), this was not the case for this preschool group. Overall, the syllable did not seem to be the best perceptual unit for learning to read.

The facts that each of the three reading procedures (whole-word, syllable and phonics) showed unique advantages in this study, that words were learned by all procedures, and that all words were maintained equally well, lead to the conclusion that combination of approaches for beginning readers is feasible and very desirable. Generally, reading professionals have championed a

combination approach (Venezky, 1975) because the learning of some words is more suitable to one procedure than another. Other reasons for the endorsement of a combination of approaches are that the whole-word approach is thought to facilitate speed and comprehension while syllable and phonics facilitate decoding (Chall, 1978). Since speed, comprehension and decoding are all desirable in reading, it follows that a combination of procedures should be used.

The attempts by many researchers to determine which method of reading instruction is the "best" is perhaps not an appropriate question. This study suggests that methods that are best should be determined on the basis of which ones, under which conditions, aid responses at different times and with different stimuli. Therefore, the science of teaching reading should begin to move from a molar to a molecular orientation.

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Table 1

Individual Analysis Design

Group I (n = 3)	Group II (n = 3)
ORIGINAL TRAINING Fall Semester (Subjects A, B, C)	ORIGINAL TRAINING Fall Semester (Subjects D, E, F)
Three-letter words counter-balanced across subjects, teaching methods and presentation order.	Four-letter words counter-balanced across subjects, teaching methods and presentation order.
REPLICATION Spring Semester (Subjects A, B, C)	REPLICATION Spring Semester (Subjects G, E, F)
Four-letter words counter-balanced across subjects, teaching methods and presentation order.	Five-letter words counter-balanced across subjects, teaching methods and presentation order.

Table 2

Counterbalancing Procedure

	Three-Letter Words			Four-Letter Words			Five-Letter Words		
SIGHT	HOT	CUP	LEG	HAND	FAST	JUMP	CANDY	TOKEN	BACON
	LIP	BAT	DOG	SODA	PONY	OVEN	CABIN	WAGON	SEVEN
SYLLABLE	CUP	LEG	HOT	FAST	JUMP	HAND	TOKEN	BACON	CANDY
	BAT	DOG	LIP	PONY	OVEN	SODA	WAGON	SEVEN	CABIN
PHONICS	LEG	HOT	CUP	JUMP	HAND	FAST	BACON	CANDY	TOKEN
	DOG	LIP	BAT	OVEN	SODA	PONY	SEVEN	CABIN	WAGON
	A	B	C	A&E	B&D	C&F	G	E	F
	SUBJECTS			SUBJECTS			SUBJECTS		

Table 3

Example of a Single Subject's Experimental History

ORIGINAL TRAINING

Prerequisite Skill	Preprobes	Machine Training	Word Training On Six Words	Postprobes	Other Generalization Probes
1. Word meaning as tested by pointing to correct picture representation.	1. Recall of words to be trained. 2. Recognition of words to be trained. 3. Recall of letter names in words to be trained. 4. Recall of letter sounds in words to be trained. 5. Recall of syllables in words to be trained. 6. Recall of pseudo-words. 7. Recall of training words in compound words.	1. Training on the use of the Language Master with child's name card.	1. Simultaneous training within each session of three words, each of which is taught by a different method: sight, syllable and phonics. 2. Daily probes before and after training. Criterion for learning was two consecutive sessions at 100% of preprobe level. Postprobes were for rehearsal. 3. Training continued until six words were learned--two by each method.	1. Twelve sessions of recall of learned words for maintenance. 2. Recognition of learned words. 3. Word meaning as tested by pointing to correct picture representation. 4. Recall of letter sounds in all words. 5. Recall of syllable sounds in all words. 6. Recall of pseudo-words. 7. Recall of learned words in compound words.	1. Recall of learned words in sentences. 2. Recall of learned words in stories.

REPLICATION (Repeat of Above Procedures)

Table 4

Percent Letter-Order Recognition Errors to Words with One Incorrect Letter

Fall Semester

	Subject	Sight	Syllable	Phonics	Combined
3-Letter Words	A	13	25	29	22
	B	21	25	29	25
	C	29	29	29	29
	Sub-Mean	21	26	29	25
4-Letter Words	D	4	8	0	4
	E	29	21	25	25
	F	29	38	38	35
	Sub-Mean	21	22	21	21
	Total Mean	21	24	25	23

Spring Semester

4-Letter Words	A	21	8	25	18
	B	17	29	21	22
	C	21	29	21	24
	Sub-Mean	19	22	22	21
5-Letter Words	G	36	33	33	34
	E	31	22	22	25
	F	28	33	31	30
	Sub-Mean	31	30	29	30
	Total Mean	27	27	26	26

$$\left(\% = \frac{\text{Errors}}{\text{Opportunities To Make Errors}} \times 100\right)$$

Fig. 1. The group mean sessions to word acquisition under the sight, syllable and phonics procedures for the fall and spring semesters. Data are presented for the two subgroups (Subjects A, B, C and Subjects D or G, E, F) and for the total group.

GROUP MEAN SESSIONS TO ACQUISITION UNDER SIGHT, SYLLABLE AND PHONICS

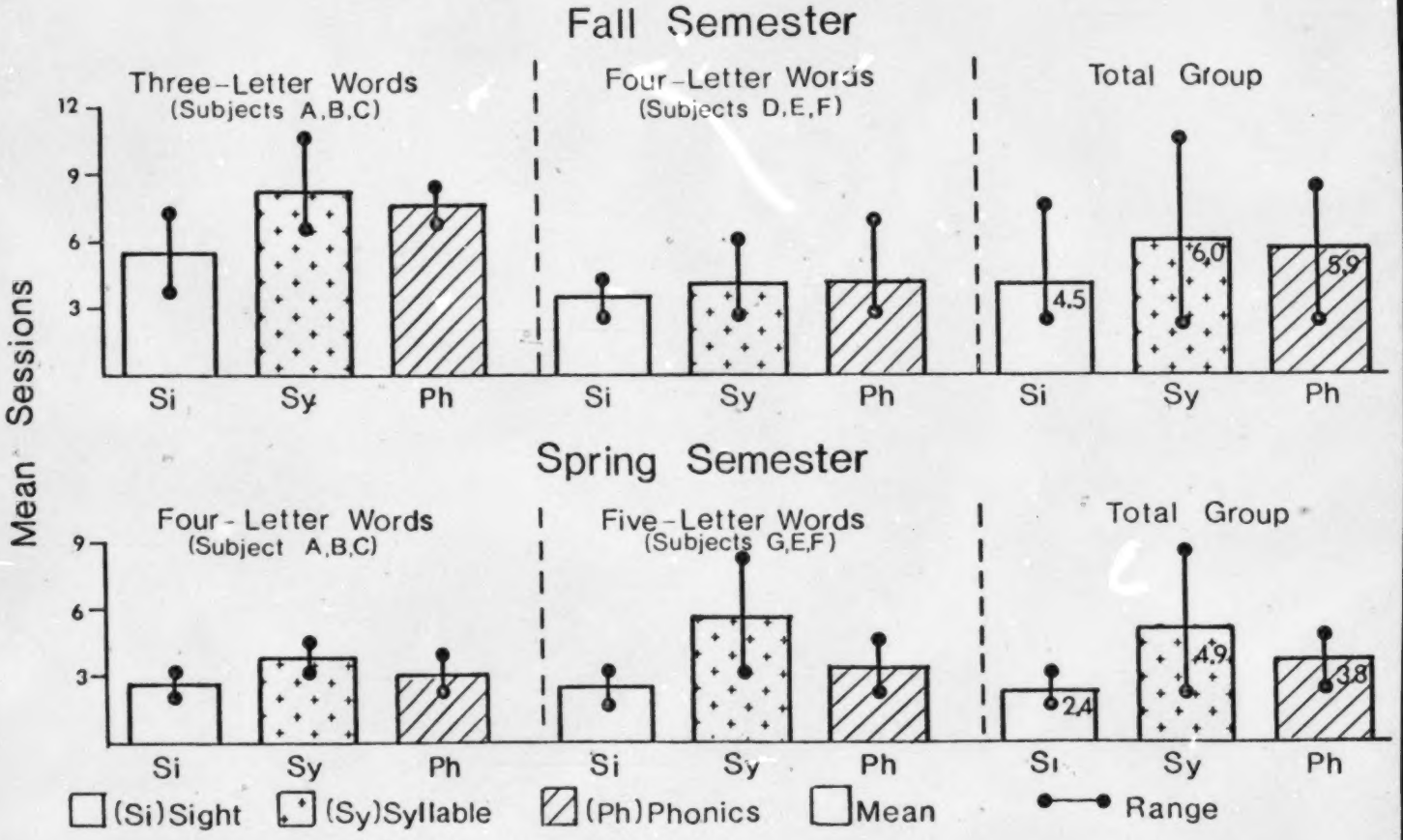


Fig. 2. The group percentage of training errors under the sight, syllable and phonics procedures for the fall and spring semesters. Data are presented for the two subgroups (Subjects A, B, C and Subjects D or G, E, F) and for the total group.

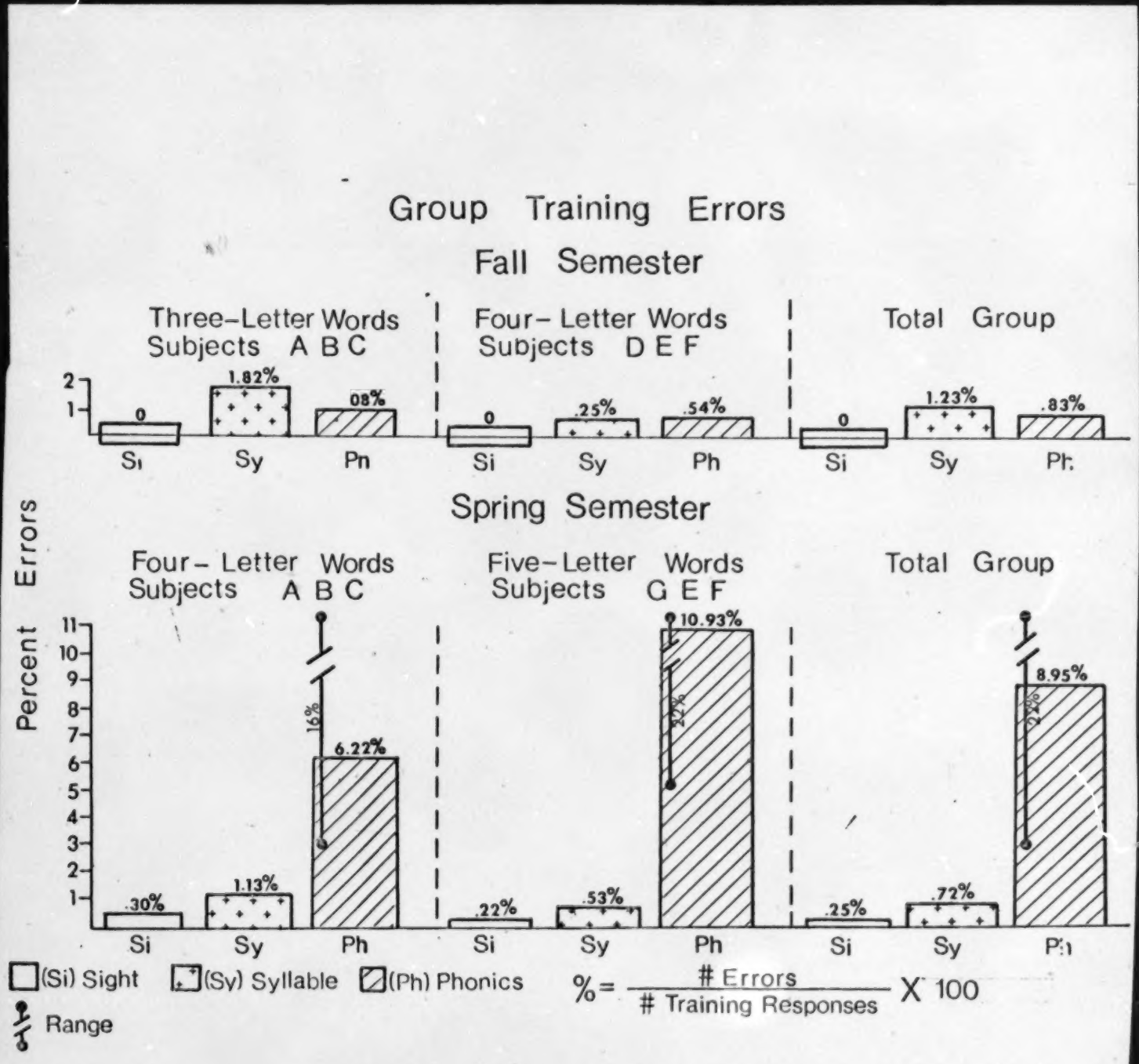

Group Training Errors
Fall Semester
Three-Letter Words
Subjects A B C
Four- Letter Words
Subjects D E F
Total Group
0
1.82%
08%
0
.25%
.54%
0
1.23%
.83%
Si
Sy
Ph
Spring Semester
Four- Letter Words
Subjects A B C
Five-Letter Words
Subjects G E F
Total Group
Percent Errors
.30%
1.13%
16%
6.22%
.22%
.53%
10.93%
20%
.25%
.72%
8.95%
5.8%
(Si) Sight
(Sy) Syllable
(Ph) Phonics
Range
% = # Errors / # Training Responses X 100

Fig. 3. The group percentages for recall of learned words in compound words for the sight, syllable and phonics procedures during the fall and spring semesters. Data are presented for the two subgroups (Subjects A, B, C and Subjects D or G, E, F) and the total group.

GROUP PERCENT RECALL OF LEARNED WORDS IN COMPOUND WORDS

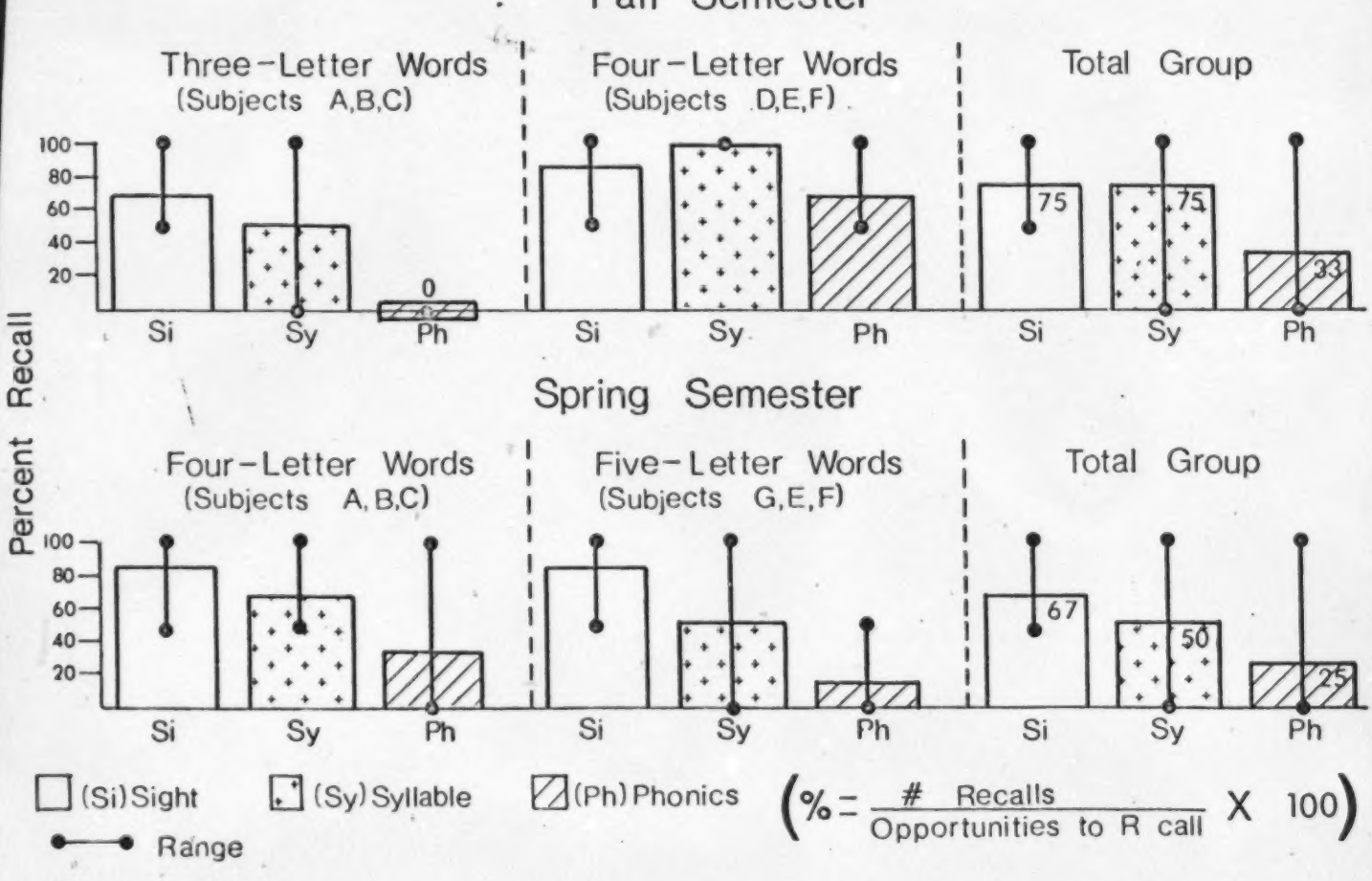


Fig. 4. The group percentages of recall to learned words in generalization sentences for the sight, syllable and phonics procedures during the fall and spring semesters. Data are presented for the two sub-groups (Subjects A, B, C and Subjects D or G E, F) and the total group.

GROUP PERCENT RECALL TO LEARNED WORDS IN GENERALIZATION SENTENCES

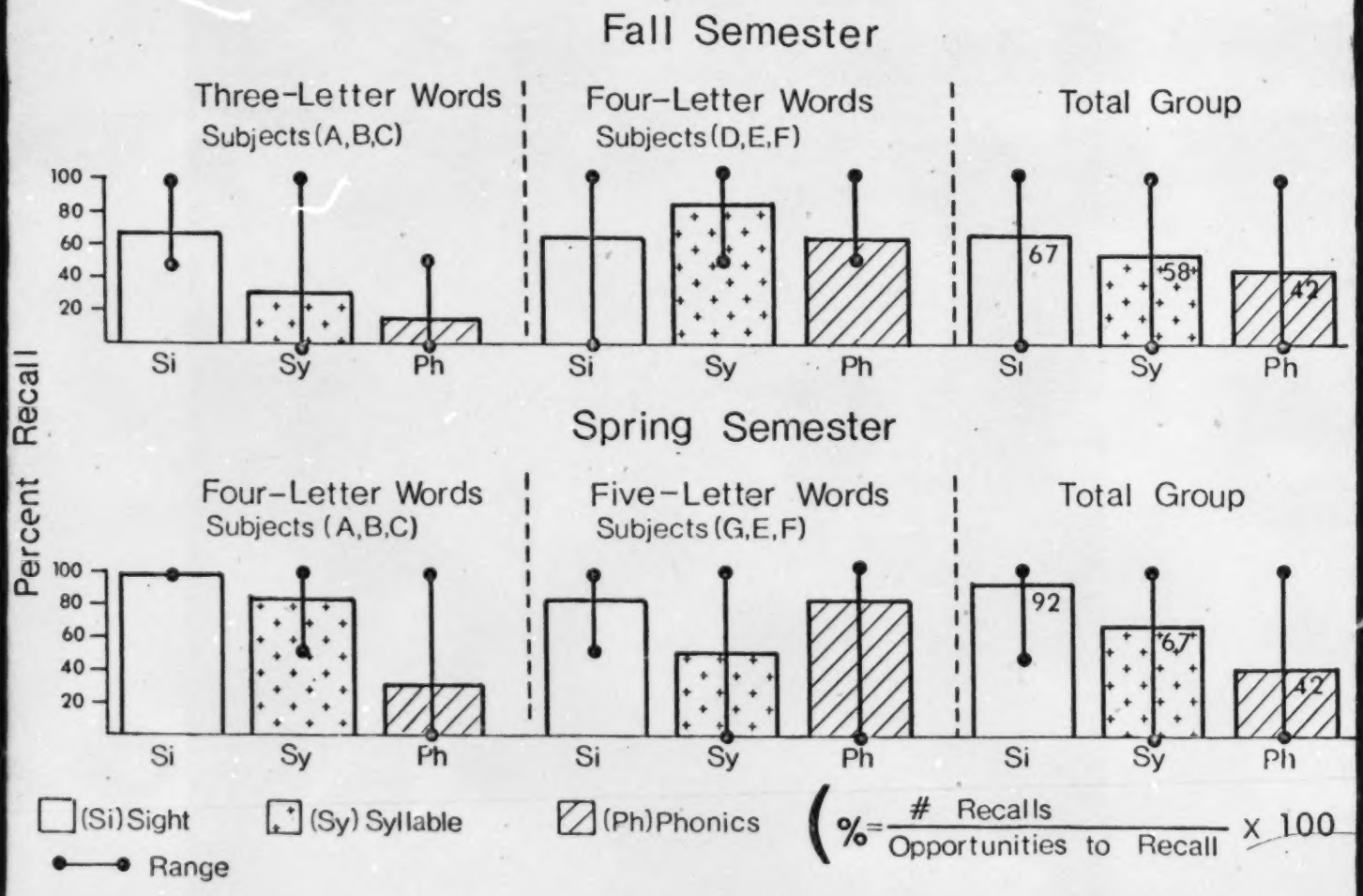


Fig. 5. The group percentages of recall to learned words in generalization stories for the sight, syllable and phonics procedures during the fall and spring semesters. Data are presented for the two sub-groups (Subjects A, B, C and Subjects D or G, E, F) and the total group.

GROUP PERCENT RECALL TO LEARNED WORDS IN GENERALIZATION STORIES

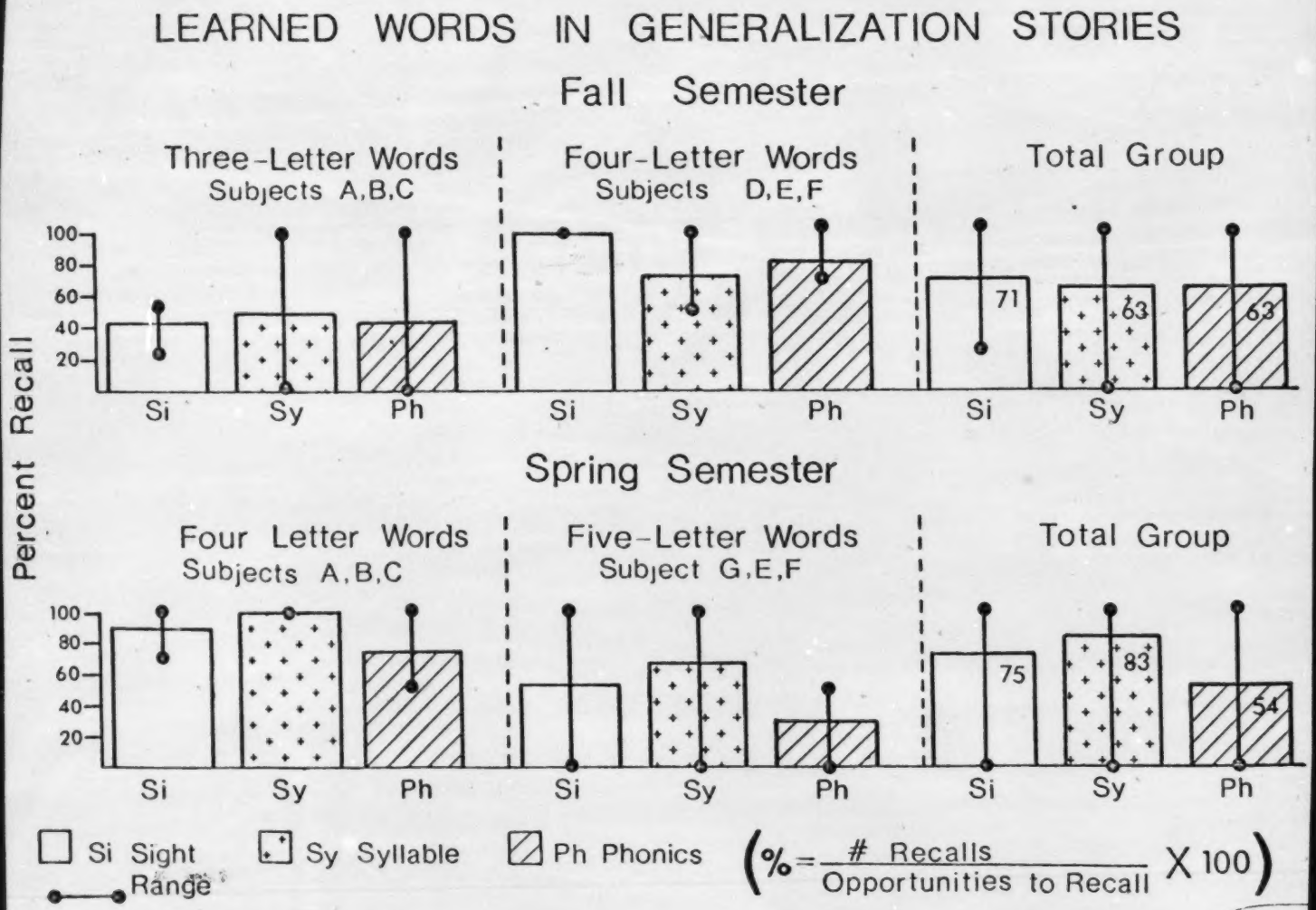


Fig. 6. The group reproduction of individual letter sounds after word training not recalled prior to training for the sight, syllable and phonics procedures during the fall and spring semesters. The data are presented for the two subgroups (Subjects A, B, C and Subjects D or G, E, F) and the total group.

GROUP REPRODUCTION OF LETTER SOUNDS AFTER WORD TRAINING, NOT RECALLED PRIOR TO TRAINING

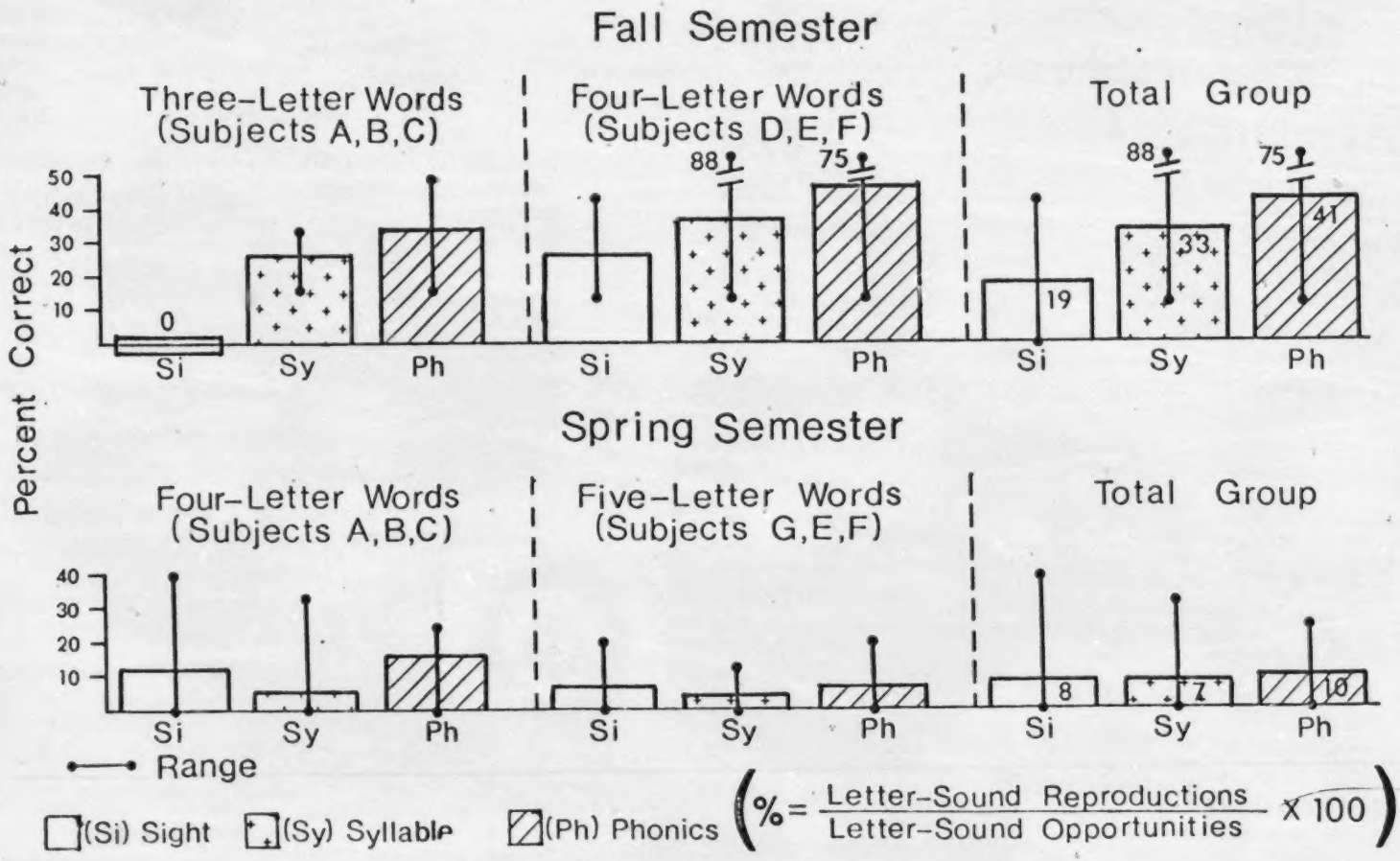


Fig. 7. The group percentages of pseudo-word generalization for the sight, syllable and phonics procedures during the fall and spring semesters. Data are presented for the two subgroups (Subjects A, B, C and Subjects D or G, E, F) and the total group.

GROUP PERCENTAGES PSEUDO-WORD GENERALIZATION

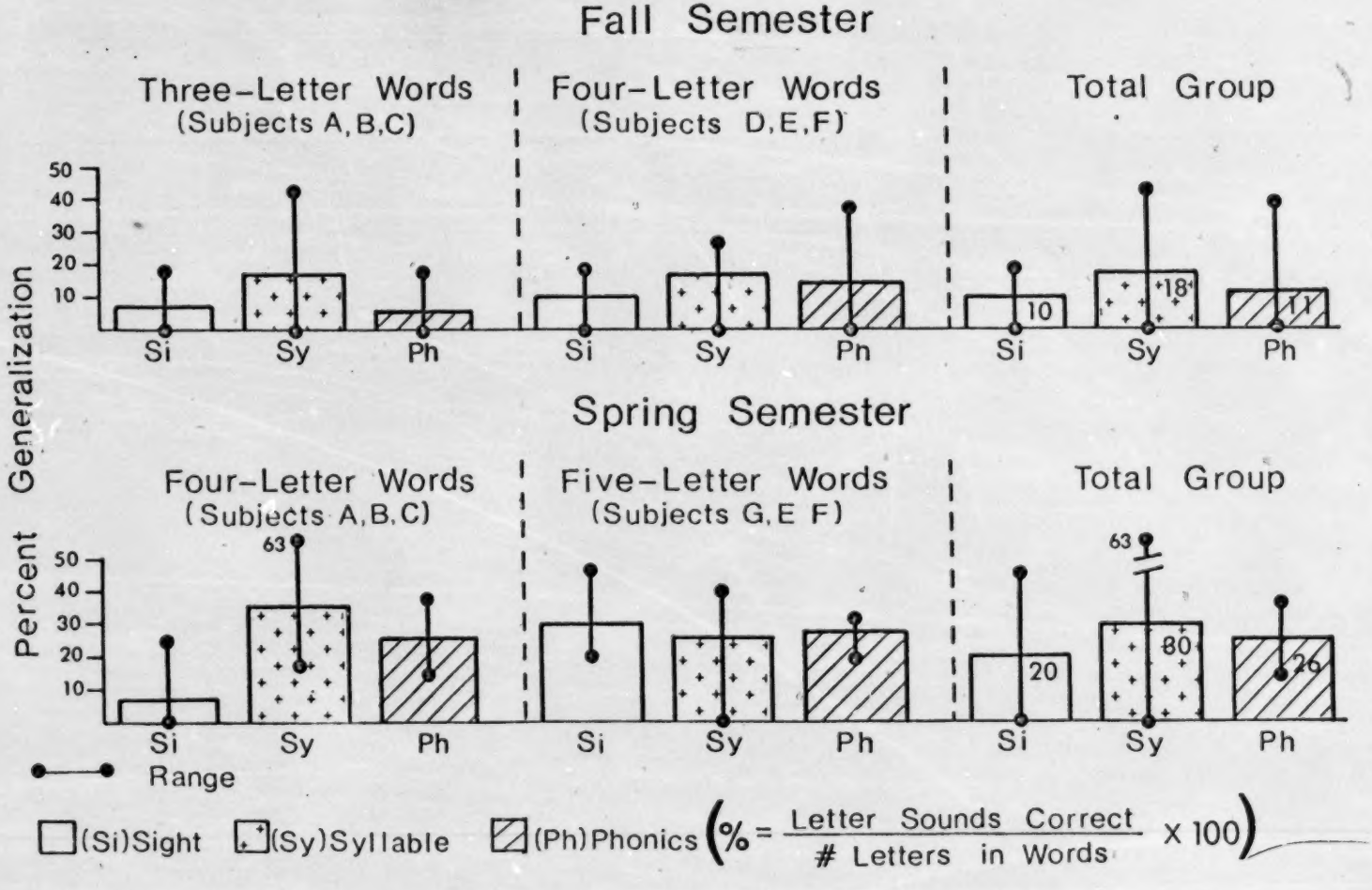
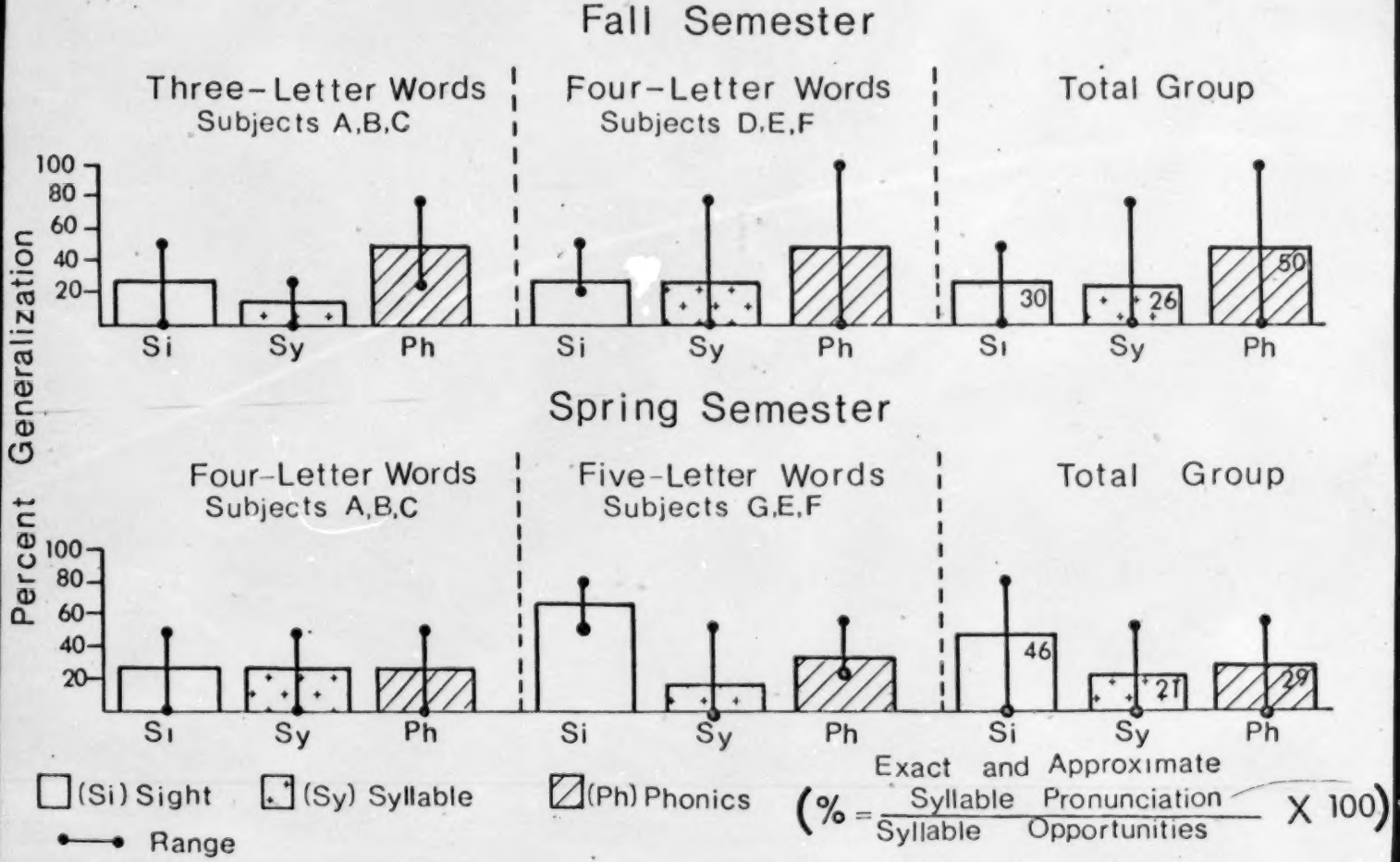


Fig. 8. The group percentages for syllable generalization for the sight, syllable and phonics procedures during the fall and spring semesters. Exact and approximate syllable generalization are included in the percentage. Data are presented for the two subgroups (Subjects A, B C and Subjects D or G, E, F) and the total group.

GROUP PERCENT SYLLABLE GENERALIZATION



FOOTNOTE

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